354 PRECISION AIRSPEED TESTER OPERATING INSTRUCTIONS

Meriam's new Model 354 provides accurate Airspeed Indication and Pitot System Leak Testing at the stroke of a key. The 354 is microprocessor based and has ± 0.05% of full scale accuracy including all effects of linearity, repeatability, **hysteresis and temperature** over the range of 23ºF to 122°F. Airspeed can be displayed in knots, mph, or km/h. Resolution of airspeed units is to the nearest tenth.Other display options include user selectable pressure units in inches of H_2O, inches of Hg, PSI or millibars. A leak test feature is included in the 354 to allow trouble shooting aircraft pitot systems. For convenient re-zeroing of the unit, a "ZERO" key is included. The combination of Airspeed Indication, Leak Testing and Accuracy makes the 354 a great instrument for maintaining airspeed indicators and pitot systems.

TABLE OF CONTENTS

Subject	Page
Keypad functions	1
Measure Mode	2
Program Mode	2
Units Select	2
Damp Rate Select	4
Auto Shut Off	5
User Info Select / Start-up Header information	6
Contrast Select	8
Battery change-out / PITOT and STATIC connections	9
Accuracy Verification / Re-calibration	10
Specifications	Inside Back Cover

F/N 354:440-2
04/24/2000

KEYPAD FUNCTIONS

ON/OFF & BACKSPACE KEY

Turns the tester on and then turns it off from the **Measure Mode**. Also serves as a backspace key ← when editing in the **Program Mode.** The backspace function takes the user out of a programmable register without changing the previous setting. Pressing this key repeatedly will return the user to the **Measure Mode** and then shut off the tester.

LEAK & UP ARROW KEY

In the **Measure Mode** activates and deactivates the **LEAK** function per established guidelines. After an aircraft's pitot system is pressurized to a desired level, **LEAK** starts a 60 second settling time countdown. A 60 second leak test follows displaying starting airspeed in upper right and current airspeed in upper left. Leak in KNOTS /minute or MPH/minute is displayed after test period. Up arrow ↑ key is used to scroll through the programmable registers menu when the unit is in the **Program Mode**. Once a programmable register is selected the up arrow ↑ can be used to edit that register.

ZERO & DOWN ARROW KEY

In the **Measure Mode** activates the ZERO function. A "ZERO IN PROGRESS" message is displayed with a countdown from 9 to 0 to indicate proper performance. Down arrow ↓ key is used to scroll through the program registers menu when the unit is in the **Program Mode**. Once a programmable register is selected the down arrow ↓ can be used to edit that register.

PRGM & ENTER KEY

Puts the tester into **Program Mode** from **Measure Mode**. When in the **Program Mode**, pressing this key selects the programmable register to be edited. After the register has been edited, pressing the PRGM key enters the new setting into the tester's non-volatile memory. This key also acts as a forward space → key when editing user input such as the header name.

MEASURE MODE

The **Measure Mode** is the tester's start up mode. Measured airspeed or pressure is displayed in user selected units.

PROGRAM MODE

The **Program Mode** is used to configure the tester for **Measure Mode** operation. The configurable registers that are found in the **Program Mode** are Units Select, Damp Rate Select, User Info Select, Contrast Select and Exit. The tester can be put into the **Program Mode** at any time during **Measure Mode** operation by pressing the PRGM key. The top line of the display will read "PROGRAM MODE". The bottom line will read "UNITS SELECT". Press the up or down arrow keys to scroll through the **Program Mode** to the desired register.

UNITS SELECT

The standard engineering units available on the Precision Airspeed Tester are the following:

1. KNOTS
2. MPH
3. KM / H
4. INCHES OF H_2O
5. INCHES OF Hg
6. PSI
7. MILLIBARS

To change the engineering unit of measure the tester should be "ON" and in the **Measure Mode**. Then use the following steps:

Keystroke	Display
1. Press PRGM key.	Top line reads "PROGRAM MODE" and bottom line reads "UNITS SELECT".
2. Press ENTER key (right ➔ arrow).	Top line reads "UNITS SELECT" and bottom shows current engineering unit.

3. Press up ↑ or down ↓ arrow key until desired engineering unit is displayed.	Engineering units on bottom line of display change.
4. Press ENTER key (right → arrow) to select desired engineering unit.	Top line reads "PROGRAM MODE" and bottom line reads "UNITS SELECT".
5. Press the backspace ← arrow key.	Display returns to **Measure Mode** in new engineering unit.

DAMP RATE SELECT

Adjustable damping is available to steady the display when measuring pulsating airspeed or pressure. The Precision Airspeed Tester has damping rates of 0.1, 0.2, 0.5, 1, 2, and 5 seconds. Damping is done by averaging new data from the pressure sensor against previously collected data. The microprocessor collects data from the sensor every 0.1 seconds. When set at 0.1 seconds, the display updates every 0.5 seconds showing the current 0.1 second pressure reading. When set at 5 seconds, the display updates every 0.5 seconds showing the average of the previous 5 seconds' readings. Therefore, at this setting it takes 5 seconds from the time pressure is changed until the tester displays the actual applied pressure. To set the damp rate follow these keystrokes:

Keystroke	Display
1. From the **Measure Mode**, press the PRGM key.	Top line reads "PROGRAM MODE" bottom line reads "UNITS SELECT".
2. Press the up ↑ arrow key.	Bottom line reads "DAMP RATE SELECT".
3. Press ENTER key (right → arrow).	Top line reads "DAMP RATE SELECT", bottom line reads the current damp rate.
4. Press the up ↑ or down ↓ arrow keys to change to desired rate.	Bottom line shows new damp rate in seconds.
5. Press ENTER key (right → arrow).	Selects damp rate, top line reads "PROGRAM MODE", bottom line reads "UNITS SELECT".
6. Press the backspace ← arrow.	Returns to **Measure Mode.**

AUTO SHUT-OFF

Enabling the Auto Shut-Off feature allows the tester to turn itself off after a user selected period of keypad inactivity. Selectable options include DISABLED, 10 Minutes, 20 Minutes, 30 Minutes, 60 Minutes and 90 Minutes. Disabling this feature limits the Pitot Display to being turned off by using the ON/OFF key only. Units are shipped from the factory with the Auto Shut-Off set for 10 Minutes. To change the auto shut-off setting, follow the steps below.

Keystroke	Display
1. From the **Measure Mode**, press the PRGM key.	Top line reads "PROGRAM MODE", bottom line reads "UNITS SELECT".
2. Press up ↑ arrow key twice.	Top line reads "PROGRAM MODE", bottom line reads "USER INFO SELECT".
3. Press ENTER key (right → arrow), then up ↑ arrow key three times.	Top line reads "AUTO SHUT-OFF", bottom reads "ENTER TO SELECT".
4. Press ENTER key (right → arrow), then the up ↑ or down ↓arrow keys until desired shut-off time is shown.	Top line reads "AUTO SHUT-OFF", bottom line toggles to "DISABLED", "10 Minutes", "20 Minutes", "30 Minutes", "60 Minutes" and "90 Minutes".
5. Press ENTER key (right → arrow).	Desired Auto Shut-Off time is selected, top line reads "AUTO SHUT-OFF", bottom reads "ENTER TO SELECT".
6. Press the backspace ← arrow key twice.	Returns to **Measure Mode.**

USER INFO SELECT

The User Info Select register is designed to provide the user with information on the hardware and software in the tester. This register stores information on the sensor's serial number, software version, date of last calibration, Auto Shut-Off status and the instrument Start-Up Header. This Header appears on the top display line when the tester is turned on. The factory setting of the Header is "MERIAM INSTR." but can be edited to show a custom alpha-numeric string as desired by the user. To view or configure any Unit Info Select register, follow the keystrokes listed below.

Keystroke	Display
1. From the **Measure Mode**, press the PRGM key.	Top line reads "PROGRAM MODE". Bottom line reads "UNITS SELECT"
2. Press the up ↑ arrow key two times.	Bottom line changes to "USER INFO SELECT"
3. Press the ENTER key (➔).	Bottom line shows serial number.
4. Press the up ↑ arrow key.	Software version number shown.
5. Press the up ↑ arrow key.	Calibration date shown.
6. Press the up ↑ arrow key.	Top line reads "AUTO SHUT OFF", bottom line reads "ENTER TO SELECT".
7. To set the AUTO SHUT-OFF	see steps 4 - 6 on page 5.
8. To edit the Header, press the up ↑ arrow key .	Top line reads "HEADER NAME", bottom line reads "MERIAM INSTR.", cursor flashes at bottom left.

9. Press the up ↑ or down ↓ arrow keys to set the alpha-numeric value.	Displays a number between 0 and 9, a letter from A to Z, / or a blank space.
10. Press ENTER key (right → arrow) to accept the selected value.	Cursor advances one space to right.
11. Repeat steps 11 and 12 until the desired Header is shown.	
12. If an error is made, press the back ←arrow key until cursor is over the incorrect value. Follow step 9 - 11 to correct. Press the right → arrow to advance the cursor without changing values.	Corrected value is displayed.
13. When Header is complete press the PRGM key to advance cursor to line end.	Cursor flashes at bottom right.
14. Press ENTER key (right → arrow).	Top line reads "PROGRAM MODE" bottom reads "UNITS SELECT".
15. Press the backspace ← arrow key.	Returns to **Measure Mode.**

CONTRAST SELECT

The Contrast Select register allows the user to adjust the character contrast of the LCD display to provide the best visibility for the ambient conditions. If during the contrast adjustment an error is made, pressing the backspace ← key returns the display to the previous contrast setting. To adjust the contrast follow the keystrokes below:

Keystroke	Display
1. From the **Measure Mode** press the PRGM key.	Top line reads "PROGRAM MODE" bottom reads "UNITS SELECT".
2. Press the up ↑ arrow key three times.	Bottom line reads "CONTRAST SELECT".
3. Press ENTER key (right → arrow).	Top line reads "CONTRAST ADJUST", bottom line shows a numeric value.
4. Press up ↑ arrow to decrease contrast or down ↓ arrow to increase the contrast.	LCD lightens or darkens depending on value set.
5. Press the PRGM key.	Accepts selected setting, top line reads "PROGRAM MODE", bottom reads "UNITS SELECT".
6. Press backspace ← arrow key.	Returns to **Measure Mode.**

Changing The Battery

The tester is powered by a 9 volt alkaline (or lithium) battery. When the output of the battery under load drops below 6.5 volts the display flashes "LOW POWER DETECT" and "REPLACE BATTERY". To replace the battery, locate the battery compartment in the bottom rear of the tester. Push down on the small rectangular area on the battery cover and slide the cover out the bottom of the unit. Pull the battery connector off the battery terminals. Plug the new battery into the connector and install in the compartment. Slide the battery cover on until the locking clip locks into the tester housing.

Pitot and Static Connections

1/8" FNPT bulkhead connections are provided on the upper end of the Precision Airspeed Tester. The left hand connection is the high pressure side of the differential pressure sensor and is labeled "PITOT". The right hand connection is labeled "STATIC" and is the low pressure side. The connections will allow the user to check airspeed indicators under conditions of simulated altitude if desired. To do this, apply a vacuum pressure to each connection and then isolate the "PITOT" side from the vacuum source. Then increase the pressure applied to the "PITOT" side with a pressure source. The resulting difference between "PITOT" and "STATIC" pressures will be displayed as airspeed under simulated altitude conditions.

When using the 354 Precision Airspeed Tester for other pressure measurements, be sure to use the "PITOT" connection for the high pressure. If measuring gauge pressure for example, simply vent the "STATIC" side to atmosphere and apply up to 200" H_2O gauge (7.22 PSIG) to the high side labeled "PITOT". If measuring vacuum pressures down to -200" H_2O gauge (-7.22 PSIG), vent the "PITOT" side to atmosphere and apply the vacuum to the "STATIC" side.

ACCURACY VERIFICATION / RE-CALIBRATION

The Precision Airspeed Tester's accuracy can be verified using a ±0.01% of reading deadweight tester. The tester should be checked at a minimum of four test points: 25%, 50%, 75% and 100% of the units range (200" H_20). Before performing the evaluation, consider the following information.

1. Use the User Unit Select option in **Program Mode** to match the Precision Airspeed Tester units to the deadweight tester units. Be sure to match the temperature reference of the deadweight tester to the Precision Airspeed Tester temperature reference (60° F for inches H_20 and 0° C for inches Hg; PSI and Millibars have no reference).

2. Correct the deadweight tester readings for ambient temperature when it is different from the reference temperature. The Precision Airspeed Tester does this automatically.

3. The local gravity where the evaluation is being performed must be corrected for on the deadweight tester. Standard gravity reference is 980.665 cm/sec/sec (45° north latitude at sea level).

4. Make sure there are no leaks in the system.

This evaluation will confirm whether the tester is operating within its accuracy specification throughout the operating temperature range. If found to be out of specification, the tester must be returned to the factory for NIST traceable re-calibration. The Smart Manometer cannot be re-calibrated in the field. Contact the Meriam Instrument distributor in your area or call the factory at the number listed below for a Return Material Authorization (RMA) number.

Meriam Instrument
10920 Madison Ave.
Cleveland, OH 44102

Ph. (216) 281-1100
Fax (216) 281-0228

PRODUCT SPECIFICATIONS

MODEL NUMBER AND RANGE:

354-DN0200 — 0-200 inches H_2O, 10-514 knots

NIST TRACEABLE ACCURACY:

± 0.05% of F.S. (F.S. = 200 inches H_2O)

RECOMMENDED RECERTIFICATION PERIOD: 1 Year

LEAK: Test function per the following guidelines:

(1) 60 second settling time countdown.

(2) during the next 60 seconds, the display holds the initial altitude and displays the current altitude, yielding leak information.

(3) the final display shows the 60 second leak rate in knots per minute, MPH per minute or km / h per minute.

TEMPERATURE :

Storage:	-40 °F to 140 °F (-40 °C to 60 °C)
Operating:	23 °F to 122 °F (-5 °C to 50 °C)

PRESSURE LIMITS: 400 inches H_2O (15 PSI)

POWER: 9 volt Alkaline battery. 9 volt Lithium batteries can also be used and are recommended below 32 ºF (0 °C).

MEDIA COMPATIBILITY: Clean, dry, non-corrosive gases.

DISPLAY: 5 significant digit LCD (0.25" high).
2 line x 16 alphanumeric characters

CONNECTIONS: 1/8" female NPT, 316ss. **WEIGHT:** 14 ounces

ENCLOSURE: (6.5" x 3.6" x 2.25") ABS plastic case.